

TYPES OF PETROLEUM BITUMEN AND PRODUCTION STAGES

Ochilov Azizbek Ulugbek ogli

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Petroleum bitumen, also known as "asphalt" in the United States, is a viscous, black liquid or semi-solid derived from the distillation of crude oil, or found naturally in deposits. It is prized for its waterproofing and adhesive properties and is extensively used in construction for roads, highways, and roofing. Bitumen is a complex mixture of hydrocarbons containing sulfur, oxygen, and nitrogen, and its properties can be modified during refining to produce specific grades for different applications. This bitumen is a dense, sticky, dark substance that can be a liquid or a semi-solid at room temperature. The heaviest residual product from the fractional distillation of crude oil. A complex mixture of hydrocarbons, including saturated hydrocarbons, aromatic hydrocarbons, and heterocyclic compounds containing sulfur, oxygen, and nitrogen.

Petroleum bitumen is categorized by its properties (e.g., penetration, viscosity) and is produced through refining crude oil via atmospheric and vacuum distillation, which separates bitumen from lighter fractions. The resulting straight-run bitumen can be modified through processes like air blowing (oxidation) to create harder, more specialized bitumens, or through blending with polymers (polymer-modified bitumen) to enhance performance.

The production of petroleum bitumen is a multi-stage process, starting with the raw material and ending with a usable product.

1. Atmospheric Distillation: Crude oil is heated to approximately 350–400°C in a tall column. Lighter fractions like gasoline are separated, leaving a heavier residue called atmospheric residue.

2. Vacuum Distillation: The atmospheric residue is transferred to a vacuum distillation unit. The reduced pressure lowers the boiling points of the heavy components, allowing for further separation without causing thermal degradation.

3. Straight-Run Bitumen: The remaining material at the bottom of the vacuum distillation column is vacuum bottom, which is essentially straight-run bitumen. Its properties vary depending on the crude oil and the distillation process.

4. Modification (Optional): To achieve specific properties for different applications, the straight-run bitumen can undergo further processing:

5. Air Blowing (Oxidation): Hot air is blown through the vacuum bottom to increase its viscosity and hardness, producing oxidized bitumen used in roofing and industrial applications.

6. Polymer Modification: Polymers or other chemical additives are mixed with the bitumen to improve its flexibility, resistance to cracking, and durability.

7. Blending: Different grades of bitumen or modified bitumen can be blended to meet specific technical requirements.

Bitumen is classified based on its physical characteristics and manufacturing method.

- ✓ Straight-Run Bitumen: Produced directly from vacuum distillation with no further modification.

- ✓ Oxidized Bitumen: Hardened bitumen with increased viscosity and softening point, created through the air blowing process.

- ✓ Polymer-Modified Bitumen (PMB): Bitumen blended with polymers to enhance its performance properties, such as flexibility and crack resistance.

- ✓ Cutback Bitumen: Bitumen that has been reduced in viscosity by the addition of a diluent (solvent), making it easier to use in cold conditions.

Bitumen Emulsion: A stable dispersion of bitumen in water, often used for road paving and roofing..

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